

# GROWING

## Mathematically

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Multiplicative Thinking

Teacher's Manual

Instructions for teachers

(Trial Version)

## Instructions for administering the Assessment Options

The purpose of the assessments is to find out what students know and can do, beyond whether they get the correct answers. Each task is marked using a detailed scoring rubric provided with the assessment options. The total score obtained by a student can be mapped to the *Learning Assessment Framework for Multiplicative Thinking* (LAF) using the Raw Score Translator for that option.

Because this is a trial, students are asked to create a unique identifier that will be used to link pre- and post-intervention assessments. Students will be recognised by the project team through this identifier to ensure their privacy, hence the provision of an Excel spreadsheet. It is important that the spreadsheet only contains the unique student identifier and the student's score on each item.

While trial school teachers are advised to keep the Student Record sheets for their own purposes – we ask that you send us photocopies of any unusual or interesting student responses. Please ensure that the student code is included on any work samples. These can be sent electronically with the spreadsheet or posted to the AAMT office.

Please note that because this is a trial of new materials, it is possible that the Raw Score Translator may be slightly inaccurate. If there are groups of students who appear to be working way above or below your expectations, based on what you know about these students, please make a note of this and let the project team know. Your insights are important in refining the materials for other teachers to use. \*

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\*Text particular to the trial version of this document is styled in grey.

**Please read the following instructions carefully before using the updated SNMY/RMFII Assessment Options for Multiplicative Thinking.**

### **Before using the Assessment Option**

#### **Allocate sufficient time**

For the assessment to be a valid reflection of students' multiplicative thinking, it is essential that they have sufficient time to do as much as they can on each task. The tasks have been designed to be given over three to four sessions within a 1 to 2-week period. For instance, many teachers do the extended task in one teaching session then one or two of the shorter tasks at the start of subsequent teaching sessions.

While teachers may choose to do more than one task per session, it is suggested that no more than two tasks be attempted in any one session unless the session is more than one hour long. In general, 30 minutes seems to be sufficient for most students to do what they can on the extended task and 10-15 minutes seems to be sufficient for student to do as much as they can on the shorter tasks.

#### **Prepare the materials**

For the purposes of the trial, you will be provided with either Option 3 or Option 4.

You will need to photocopy as many copies of the assessment tasks as needed including the two blank pages at the end. These should be prepared as booklets (i.e., printed and stapled) so that individual student work can be kept together (Note: students do not need copies of the Scoring Rubrics, Student Score sheet or Raw Score Translator).

**Prepare the class** – Treat this as you would a normal classroom activity. Try to avoid using the word 'test' and stress that the purpose of doing this is to inform future teaching.

Students should have access to pens, pencils, and erasers. Rulers may be used but they are not essential. Calculators and rulers are **not** needed.

**Use the Sample Question** – Many students are reluctant to write explanations or show their working and need to be encouraged to provide as much evidence of their mathematical thinking as possible.

The worked example below should be discussed with students to make sure that they understand what is expected of them prior to the assessment. Show and discuss the four student responses and use the scoring rubric with the class to score each response, noting that diagrams, words or symbols may be used.

In particular, it is important that students understand what is meant by the instructions:

- "Show all your working and explain your answer in as much detail as possible."
- "Explain your reasoning using as much mathematics as you can."
- "Use as much mathematics as you can to support your answer."

### SAMPLE QUESTION

A gecko is about 8 cm long.

A frilled-neck lizard is about 6 times as long as a gecko.

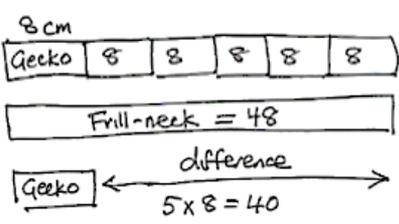
The difference between the length of a frilled-neck lizard and a gecko is about

2 cm                  14 cm                  40 cm                  48 cm  
                                                     

Explain your reasoning using as much mathematics as you can (you may use a diagram if you wish)

(ACARA, 2013)

#### Four Student Responses:

<p>Student 1.</p> <p style="margin-top: 20px;"><i>40 cm</i></p>	<p>Student 2.</p> <p style="margin-top: 20px;"><i>40 cm because I added them and subtracted</i></p>
<p>Student 3.</p> <p style="margin-top: 20px;"><i>40 cm. Frill neck is 6 geckos so <math>6 \times 8 = 48</math>. Difference is <math>48 - 8 = 40</math></i></p>	<p>Student 4.</p> <div style="text-align: center; margin-top: 10px;">  <p style="font-size: small; margin: 0;"> <math>8\text{ cm}</math>              Gecko 8 8 8 8 8              Frill-neck = 48              Gecko ← difference → <math>5 \times 8 = 40</math> </p> </div>

#### Scoring Rubric:

0	No response or irrelevant response
1	Correct (40 cm) but no reasoning or explanation provided
2	Correct, incomplete reasoning or an operational description given
3	Correct, correct reasoning using words, diagram or symbols

## Using the Assessment Option

**Distribute the booklets.** Stress that the purpose of doing this is to inform future teaching – it is in the student’s best interests to do as well as they can and not copy. Go through the instructions on the second page of the assessment booklet.

**Encourage working** – Students are expected record all of their work in the Assessment Option booklet so there is **no need** for scrap paper or jotters etc. Encourage students to explain their reasoning using words, diagrams or equations.

If they need additional space they should use the blank page at the back of the booklet. A single line should be placed through any rejected work (i.e. not obliterated or rubbed out) as it could provide some clues to students’ thinking.

**Student support** – The object of the exercise is not that students get the right answer, but that they are given an opportunity to demonstrate what they actually do know and can do largely on their own.

Teachers can support students by answering questions without telling them what to do. Avoid providing so much support that students are able to complete the task with little understanding of what they are doing or why.

Teachers may:

- read the task to any student with reading problems
- scribe an oral explanation for students whose thinking may not otherwise be fairly represented
- explain unusual words as required.

Keep unfinished Option booklets in a safe place and ensure as far as possible that all students have an opportunity to attempt all tasks.

## After using the Assessment Option

**Collect booklets** – Make sure that each student has created a unique identifier and has written this in the place provided on their booklet.

**Mark student work** – wherever possible work with colleagues to do this using the option-specific Scoring Rubrics (included with each Assessment Option). Record student scores on the Student Score Sheet, noting any interesting responses/observations in the comments column.

**Match to LAF** – When the marking is completed, the student’s total score can be compared to the option-specific Raw Score Translator (included with each Assessment Option). This will assign the student’s performance to a Zone in the Learning Assessment Framework for Multiplicative Thinking.

**Note:** There may be a small number of students who receive a zero score or a perfect score. Assuming this represents the best they can do, all that can be said about these students is that they are either below Zone 1 or above Zone 8.

**Because this is a trial please complete the spreadsheet** provided with each student’s score on each item. Use the Student Identifier only, but please indicate for each student their gender and year level. This information will help to refine the materials and determine their usefulness. Send this spreadsheet electronically to the project team.

**Identify any student work that might provide useful work samples** to help other teachers. These examples may be interesting, unusual or creative responses. The examples can be high or low level (the project needs a wide range of examples).

**Make sure the Student Identifier is clearly marked on the work sample** but remove any other identifying material (e.g., names etc). Photocopy or scan the work sample and return it to the project team.

**Any other comments you may wish to make about the materials or the process, the Teacher Booklets and the student Assessment Tasks will be welcomed by the project team.**